

CLAIMS

What is claimed is:

1. A method to receive a code division multiple access (CDMA) signal from a radio channel, comprising:

inputting a CDMA signal received through the radio channel to a searcher; and

processing the received signal in the searcher to obtain a multi-path profile of the radio channel, where processing comprises at least partially removing an effect of at least one of a transmit and a receive filter on the multi-path profile.

2. A method as in claim 1, further comprising outputting the multi-path profile to a controller for use in making demodulator finger assignments.

3. A method as in claim 1, where at least partially removing comprises passing the received CDMA signal through a filter selected to have a filter characteristic that approximates an inverted amplitude or power response of the at least one of the transmit and a receive filter.

4. A method as in claim 1, where at least partially removing comprises passing the received CDMA signal through a processing unit that uses a least squares criterion to derive the radio channel multi-path profile \mathbf{x} from a searcher profile \mathbf{y} , where $\mathbf{y} = \mathbf{F} \cdot \mathbf{x} + \mathbf{v}$, where \mathbf{v} is a noise vector and \mathbf{F} is a transmit/receive matrix.

5. A method as in claim 4, where vector \mathbf{x} is derived as $\mathbf{x} = (\mathbf{F}^T \cdot \mathbf{F})^{-1} \cdot \mathbf{F}^T \cdot \mathbf{y}$, where T denotes a transpose operation and -1 denotes an inverse matrix operation.

6. A method as in claim 5, further comprising adding a pre-whitening term to stabilize the inverse as $\mathbf{x} = (\mathbf{F}^T \cdot \mathbf{F} + \text{epsilon} \cdot \mathbf{I})^{-1} \cdot \mathbf{F}^T \cdot \mathbf{y}$.

7. A method as in claim 4, using L1 norm instead of L2 norm in the least squares

derivation.

8. A method as in claim 1, where at least partially removing is performed by searcher hardware.

9. A method as in claim 1, where at least partially removing is performed by a data processor that is external to the searcher.

10. Apparatus to receive a code division multiple access (CDMA) signal from a radio channel, comprising:

a receiver front end for receiving a CDMA signal from the radio channel; said receiver front end comprising at least one receiver filter; and

a deconvolution searcher block having an input coupled to an output of the receiver front end for inputting a received signal and an output for outputting a digital representation of a radio channel multi-path profile to a control function, said deconvolution searcher block comprising a unit for processing the received signal to at least partially remove an effect of at least said receiver filter on the multi-path profile.

11. Apparatus as in claim 10, where said unit for processing the received signal also at least partially removes an effect of a transmitter filter on the multi-path profile.

12. Apparatus as in claim 11, where said receiver is located at a mobile station, and where said transmitter is located at a base station.

13. Apparatus as in claim 11, where said receiver is located at a base station, and where said transmitter is located at a mobile station.

14. Apparatus as in claim 10, where said control function uses the multi-path profile when making demodulator finger assignments.

15. Apparatus as in claim 10, where said unit of said deconvolution searcher comprises

a filter having a filter characteristic that approximates an inverted amplitude response of at least said receiver filter.

16. Apparatus as in claim 11, where said unit of said deconvolution searcher comprises a filter having a filter characteristic that approximates an inverted response of said receiver filter and said transmitter filter.

17. Apparatus as in claim 11, where said unit of said deconvolution searcher comprises a processing unit that uses a least squares criterion to derive the radio channel multi-path profile \mathbf{x} from a searcher profile \mathbf{y} , where $\mathbf{y} = \mathbf{F} \cdot \mathbf{x} + \mathbf{v}$, where \mathbf{v} is a noise vector and \mathbf{F} is a transmit/receive matrix.

18. Apparatus as in claim 17, where vector \mathbf{x} is derived as $\mathbf{x} = (\mathbf{F}^T \cdot \mathbf{F})^{-1} \cdot \mathbf{F}^T \cdot \mathbf{y}$, where T denotes a transpose operation and -1 denotes an inverse matrix operation.

19. Apparatus as in claim 18, further comprising adding a pre-whitening term to stabilize the inverse as $\mathbf{x} = (\mathbf{F}^T \cdot \mathbf{F} + \text{epsilon} \cdot \mathbf{I})^{-1} \cdot \mathbf{F}^T \cdot \mathbf{y}$.

20. Apparatus as in claim 17, using L1 norm instead of L2 norm in the least squares derivation.

21. A mobile station having a receiver adapted to receive a code division multiple access (CDMA) signal from a radio channel, the receiver comprising a receiver front end for receiving the CDMA signal from the radio channel, said receiver front end comprising at least one receiver filter, said receiver further comprising a searcher having an input coupled to an output of the receiver front end for inputting a received signal and having an output for outputting a digital representation of a radio channel multi-path profile to a mobile station control function, said mobile station comprising a unit to at least partially remove an effect of at least said receiver filter on the multi-path profile.

22. A mobile station as in claim 21, where said unit also at least partially removes an effect of a base station transmitter filter on the multi-path profile.

23. A mobile station as in claim 21, where said control function uses the multi-path profile when making demodulator finger assignments.

24. A mobile station as in claim 21, where said unit comprises a filter having a filter characteristic that approximates an inverted response of at least said mobile station receiver filter.

25. A mobile station as in claim 22, where said unit comprises a filter having a filter characteristic that approximates an inverted amplitude or power response of said mobile station receiver filter and said base station transmitter filter.

26. A mobile station as in claim 22, where said unit comprises a processor that uses a least squares criterion to derive the radio channel multi-path profile \mathbf{x} from a searcher profile \mathbf{y} , where $\mathbf{y} = \mathbf{F} \cdot \mathbf{x} + \mathbf{v}$, where \mathbf{v} is a noise vector and \mathbf{F} is a transmit/receive matrix.

27. A mobile station as in claim 26, where vector \mathbf{x} is derived as $\mathbf{x} = (\mathbf{F}^T \cdot \mathbf{F})^{-1} \cdot \mathbf{F}^T \cdot \mathbf{y}$, where \mathbf{T} denotes a transpose operation and -1 denotes an inverse matrix operation.

28. A mobile station as in claim 27, further comprising adding a pre-whitening term to stabilize the inverse as $\mathbf{x} = (\mathbf{F}^T \cdot \mathbf{F} + \text{epsilon} \cdot \mathbf{I})^{-1} \cdot \mathbf{F}^T \cdot \mathbf{y}$.

29. A mobile station as in claim 26, using L1 norm instead of L2 norm in the least squares derivation.

30. A mobile station as in claim 22, where said unit is implemented in searcher hardware.

31. A mobile station as in claim 22, where said unit is implemented in control function software.

32. In a mobile station, a method to reduce an amount of data provided to a finger assignment algorithm, comprising:

inputting a CDMA signal received through a radio channel to a searcher; and

processing the received signal in the searcher to generate output data for the finger assignment algorithm that represents a multi-path profile of the radio channel, where processing comprises passing the received CDMA signal through a filter selected to have a filter characteristic that approximates an inverted response of at least one of a base station transmit filter and at least one mobile station receive filter so as to reduce an occurrence of multi-path sidelobes in the output data.

33. In a mobile station, a method to reduce an amount of data provided to a finger assignment algorithm, comprising:

inputting a CDMA signal received through a radio channel to a searcher; and

processing the received signal in the searcher to generate output data for the finger assignment algorithm that represents a multi-path profile of the radio channel, where processing comprises passing the received CDMA signal through a processor unit that operates in accordance with a least squares criterion to derive the radio channel multi-path profile \mathbf{x} from a searcher profile \mathbf{y} , where $\mathbf{y} = \mathbf{F} \cdot \mathbf{x} + \mathbf{v}$, where \mathbf{v} is a noise vector and \mathbf{F} is a transmit/receive matrix, so as to reduce an occurrence of multi-path sidelobes in the output data.